No. 653,873. Patented July 17, 1900.

J. A. MALONE.

PROPELLING GEAR.

(Application filed Aug. 24, 1897.)

(No Model.)

Fig. 1.

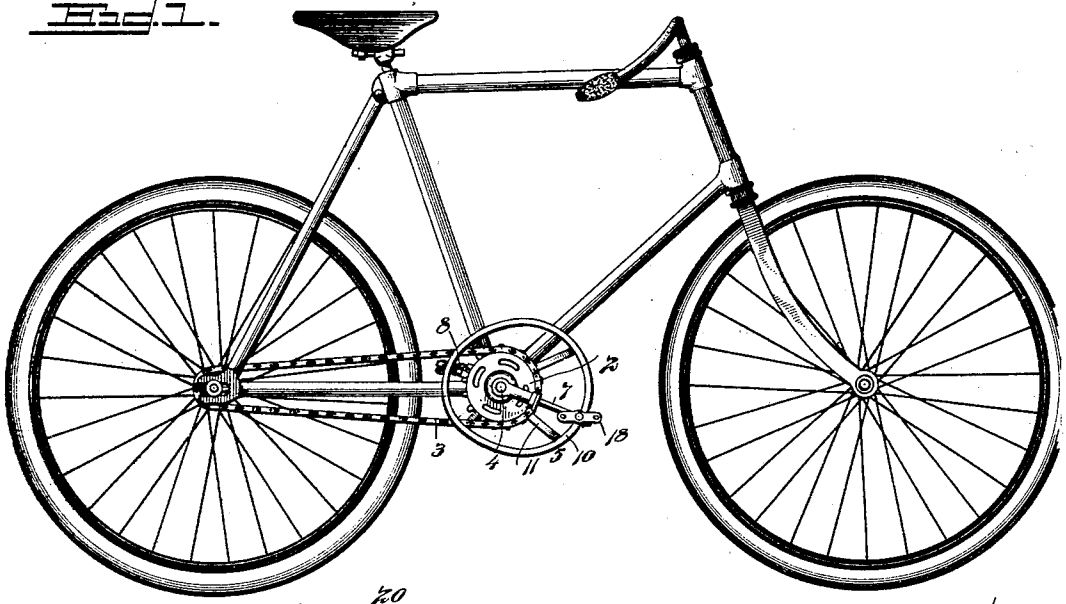


Fig. 2.

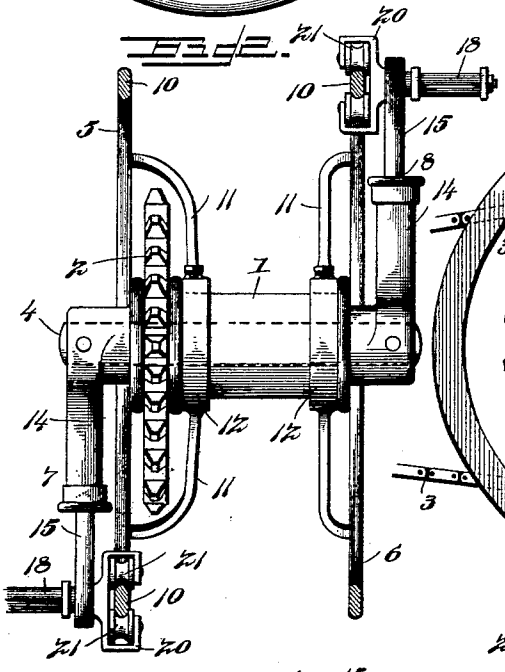


Fig. 3.

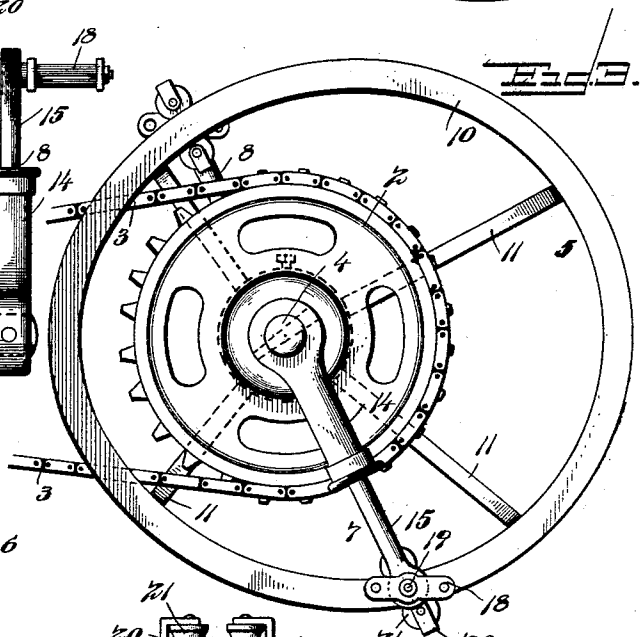


Fig. 4.

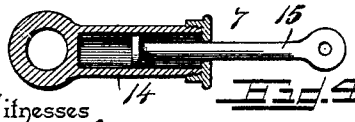
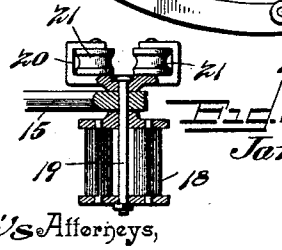


Fig. 5.



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UNITED STATES PATENT OFFICE.

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PROPELLING-GEAR.

SPECIFICATION forming part of Letters Patent No. 653,873, dated July 17, 1900.

Application filed August 24, 1897. Serial No. 649,337. (No model.)

To all whom it may concern:

Be it known that I, JAMES ANDREW MALONE, a citizen of the United States, residing at Grayson, in the county of Carter and State of Kentucky, have invented a new and useful Propelling-Gear, of which the following is a specification.

My invention relates to propelling-gear for bicycles and similar vehicles, and has for one object to provide an attachment of simple construction adapted for application to a bicycle-frame of the ordinary construction, whereby increased leverage may be obtained during the forward and downward movement of the pedal-cranks.

Further objects and advantages of this invention will appear in the following description and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view of an attachment constructed in accordance with my invention applied in the operative position to a bicycle. Fig. 2 is an elevation of the crank-hanger and cranks, showing the guide-rims and attaching devices arranged in operative relation to the crank-hanger, said guide-rims being indicated in section. Fig. 3 is a side view of the attachment. Fig. 4 is a detail sectional view of one of the crank-arms detached. Fig. 5 is a similar view of a pedal and pedal-head, showing the contiguous portion of the pedal-crank in section to illustrate the means whereby connection is made between the same.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

In the drawings I have shown the propelling mechanism embodying my invention applied in the operative position to a bicycle of the ordinary safety pattern, of which 1 designates the exteriorly-cylindrical crank-hanger, 2 the driving-sprocket, 3 the sprocket-chain, and 4 the crank-shaft, all of which may be of the ordinary or any preferred construction.

The improved propelling mechanism consists, essentially, of elliptical or cam-shaped guides 5 and 6, arranged eccentrically with relation to the crank-shaft and in planes perpendicular thereto, and extensible cranks 7 and 8, which are arranged in operative relation with said guides to travel in paths parallel therewith and secured, as in the ordinary practice, to the ends of the crank-shaft, said elements consisting of the guides and extensible cranks, being so relatively disposed as to lengthen the cranks upon their downward stroke and shorten the same upon their upward stroke to obtain increased leverage, and hence power, during the former movement without materially, if at all, increasing the length of the path traversed by the pedal.

The use of a guide or track in connection with an extensible crank-arm is made necessary not only by the fact that the movable element of the crank-arm must be guided in its extension and retraction, but also by the necessity to brace the crank-arms laterally to prevent binding and twisting, and in this connection it is necessary to employ such means as will not add materially to the weight of the vehicle. In carrying out these objects I have devised a continuous guide-rim 10, connected by bowed inwardly-extending spokes 11 with annular bands 12, fitted exteriorly upon the crank-hanger and, obviously, capable of angular or revoluble adjustment with relation to the axis of the crank-shaft as a center to secure the desired position of the major diameter of the guide. It is obvious that with bicycle or other vehicle frames of different shapes or wherein the saddle is disposed in different positions with relation to the other parts of the vehicle it is necessary to vary the positions of the guides, so as to arrange the long diameters thereof as nearly as possible at right angles to the direct line of the stroke applied to the pedals, and hence the advantage of employing in connection with an exteriorly-cylindrical crank-hanger a guide having an attaching-band 12, which is adapted for revoluble adjustment upon the crank-hanger. Any suitable means, such as set-screws 12^a, may be employed to secure these bands, and hence the tracks, at the desired adjustment. As above indicated, the bands 12 are connected with the rims 10 by inwardly-bowed spokes or braces 11; but owing to the fact that at one end of the crank-hanger is arranged the sprocket-wheel 2 it is obvious that the spokes or braces of the guide 5 are deflected to a greater extent than those of the

guide 6, it being necessary to dispose the guide-rims 10 in planes outside of the terminals of the crank-hanger or sprocket-wheels or other obstructions, and, furthermore, the guide-rims must be unobstructed at both their outer and inner peripheries, as clearly shown in the drawings.

The preferred construction of crank-arm embodies an inner member 14, adapted at its inner end to be secured to the end of the crank-shaft and being preferably tubular, and an outer member 15, extended through a removable cap at the outer end of the inner member and terminating in a plunger to fit in the bore of said inner member and reciprocate freely therein. This outer member preferably consists of a rod of suitable dimensions, terminating at its outer end in an eye suitably flattened or enlarged for the purpose, and extending through this eye is a pedal-pin 19. Upon the portion of the pedal-pin which projects outwardly from the plane of the crank-arm is mounted the pedal 18, while upon the portion of said pedal-pin which projects inwardly from the crank-arm is a pedal-head 20, consisting of a double-looped frame in the oppositely-extending loops of which are mounted grooved guide-rollers 21, of which the inner sides are spaced apart at an interval corresponding accurately with the width of the guide-rim 10. It will be seen that a single bolt serves to connect the pedal-head and the pedal proper with the crank-arm, and therefore not only is the application of these parts simplified, but in applying pressure to the pedal the strain is communicated directly to the pedal-head, and therefore any slight bending of the crank-arm, due to an excessive resistance in the crank-shaft, will not cause the binding of the rolls of the pedal-head upon the rim of the track. Furthermore, the pedal-head being swiveled upon the crank-arm by means of the bolt 19 it is free to adjust itself to inequalities in the surface of the rim or to slight changes of position of the outer end of the crank-arm, due to the above-mentioned strains. The above construction avoids the use of springs and sliding elements other than the member 15 of the crank-arm, and I have found in practice that the use of a swivel pedal-head provides for the necessary freedom of operation of the crank-arm with relation to the guide-rim, particularly as above described, when the pedal is mounted upon the same pin as the pedal-head. A further advantage in the described arrangement of the pedal and pedal-head upon a common pivot-bolt resides in the fact that any lateral strain applied to the pedal during the operation thereof will not cause a lateral deflection of the crank-arm. The direct communication of such side strains to the guide-arms will prevent deflection of the crank-arms, and hence insure the accurate movement thereof in paths parallel with the guide-rims. The inward deflection of the spokes or braces 11 provides ample resistance to lateral displacement of the rims, whereby strains due to careless riding will not affect the efficiency of the driving mechanism.

It is well known that particularly in ascending grades there is such a resistance to the forward rotation of the crank-shaft as to cause a slight flexing of the crank-arm, and it is to guard against binding or locking of the parts under such conditions that I employ the means above described for positively guiding the extensible crank-arms in their movement. The importance also of the means above described for securing the angular adjustment of the guide to dispose the major diameters of the rims in the desired positions with relation to the direction of application of pressure will be readily understood by those skilled in the art to which my invention appertains.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

In a foot-propelled vehicle, the combination with a driving-shaft an extensible crank comprising telescopically-associated sections, and a guide-rim arranged eccentrically to the driving-shaft and inwardly offset from the plane of movement of the crank, of a pedal-pin carried by the crank and projecting on opposite sides thereof, a pedal journaled on the outer end of the pedal-pin, and a yoke or pedal-head swiveled on the inner end of the pedal-pin and comprising relatively-fixed reversely-facing open loops, relatively-fixed spindles crossing said loops, and grooved rollers journaled on said spindles, and running upon and against the inner and outer edges of the guide-rim, whereby the outer section of the crank is laterally braced in both directions, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JAMES ANDREW MALONE.

Witnesses:
W. D. MALONE,
E. L. AULT.